

### Claims

1. A method for *in vitro* culture of hematopoietic progenitor cells to produce differentiated cells of non-hematopoietic lineage, comprising:  
culturing hematopoietic progenitor cells in an environment that promotes hematopoietic progenitor cell differentiation, under conditions sufficient to produce differentiated cells of non-hematopoietic lineage.
2. The method of claim 1, wherein the environment comprises a solid, porous matrix having a unitary microstructure.
3. The method of claim 1, wherein the environment comprises factors that direct differentiation of hematopoietic progenitor cells to produce differentiated cells of non-hematopoietic lineage selected from the group consisting of mesenchymal, parenchymal, neuronal, endothelial, and epithelial cells.
4. The method of claim 3, wherein the hematopoietic progenitor cells are CD34<sup>+</sup> or CD34<sup>-</sup> cells, wherein the environment comprises growth factors selected from the group consisting of bFGF and TGF- $\beta$ , to produce mesenchymal cells.
5. The method of claim 3, wherein the hematopoietic progenitor cells are CD34<sup>+</sup> or CD34<sup>-</sup> cells, and wherein the environment comprises growth factors selected from the group consisting of putrescine, progesterone, sodium selenite, insulin, transferrin, EGF, NGF, and bFGF, to produce neuronal cells.
6. The method of claim 3, wherein the hematopoietic progenitor cells are CD34<sup>+</sup> or CD34<sup>-</sup> cells, and wherein the environment comprises growth factors selected from the group consisting of IL-3, SCF, TGF- $\beta$ 1, and Flk-2/Flt-3 ligand, to produce epithelial cells.
7. The method of claim 3, wherein the hematopoietic progenitor cells are CD34<sup>+</sup> or CD34<sup>-</sup> cells, and wherein the environment comprises VEGF, to produce endothelial cells.

8. The method of claim 3, wherein the hematopoietic progenitor cells are CD34<sup>+</sup> or CD34<sup>-</sup> cells, and wherein the environment comprises EGF, bFGF, and SF/HGF, to produce parenchymal cells.
9. The method of claim 1, wherein said hematopoietic progenitor cells are obtained from a blood product.
10. The method of claim 9, wherein said blood product is unfractionated bone marrow.
11. The method of claim 2, wherein the porous, solid matrix is an open cell porous, solid matrix having a percent open space of at least 75%.
12. The method of claim 2, wherein the porous solid matrix has pores defined by interconnecting ligaments having a diameter at mid-point, on average, of less than 150 $\mu$ m.
13. The method of claim 12, wherein the porous solid matrix is a metal-coated reticulated open cell foam of carbon containing material.
14. The method of claim 13, wherein the metal is selected from the group consisting of tantalum, titanium, platinum, niobium, hafnium, tungsten, and combinations thereof, and wherein said metal is coated with a biological agent selected from the group consisting of collagens, fibronectins, laminins, integrins, angiogenic factors, anti-inflammatory factors, glycosaminoglycans, vitrogen, antibodies and fragments thereof, and combinations thereof.
15. The method of claim 3, wherein the metal is tantalum.
16. The method of claim 2, wherein the porous, solid matrix having seeded hematopoietic progenitor cells and their differentiated progeny is impregnated with a gelatinous agent that occupies pores of the matrix.
17. The method according to any of claims 4, 6 or 7, wherein the hematopoietic progenitor cells are enriched for CD34<sup>-</sup> cells.

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18. The method of claim 5 wherein the hematopoietic progenitor cells are enriched for said CD34<sup>+</sup> cells.
19. The method of claim 1, further comprising first isolating said hematopoietic cells from nonnucleated cells.
20. The method of claim 1, further comprising enriching said hematopoietic cells for cells having a common marker for a specific tissue.
21. The method of claim 1, wherein the hematopoietic progenitor cells are genetically altered.
22. The method of claims 1-21, further comprising administering said differentiated cells of non-hematopoietic lineage into a subject.
23. The method of claim 21, wherein said administering is intravenous.